

Vitro Calculus Formation, Arch. Oral Biol., Vol. 15, pp. 893-896 (1970), disclose the in vitro effectiveness of soluble pyrophosphate salts against calculus. However, they indicate that pyrophosphate efficacy would be inhibited by phosphatases in vivo.

The references suggesting that pyrophosphates could reduce calculus, but either suggesting problems associated with their use or not recognizing problems, are Rapp, G. W. et al., "Pyrophosphate: a factor in Tooth Erosion", J. D. Res. March-April 1960, Vol. 39, No. 2 pp. 372-376; the Draus article cited above; Briner et al., "In Vitro and In Vivo Evaluation of Anticalculus Agents", Calc. Tiss. 11, pp. 10-22 (1973); U.S. Pat. No. 3,934,002, Jan. 20, 1976 to Haelele; and British Patent No. 490,384, Feb. 15, 1937.

U.S. Pat. No. 4,847,070, July 11, 1989 to Pyrz et al. relates to oral compositions which are effective against calculus containing a chelating agent which is an acrylic acid polymer or copolymer or EDTA, together with a strontium source, a fluoride ion source and a pyrophosphate ion source.

U.S. Pat. No. 4,661,341, Apr. 28, 1987 to Benedict et al. relates to oral compositions containing an anticalculus agent which is an acrylic acid polymer or copolymer.

U.S. Pat. No. 4,022,880, May 10, 1977 to Vinson et al. relates to compositions for inhibiting dental plaque and calculus formation comprising zinc ions and a nontoxic, organoleptically acceptable antibacterial agent.

U.K. Patent Application GB 2,200,551, Gaffar, Nabi and Jannone, filed Jan. 27, 1988, published Aug. 10, 1988, relates to antibacterial antiplaque and anticalculus oral compositions containing a linear molecularly dehydrated polyphosphate salt and a noncationic antibacterial agent.

U.S. Pat. No. 4,656,031, Apr. 7, 1987 to Lane et al. relates to a dentifrice which includes a surfactant and an antiplaque agent comprising a substantially water-insoluble noncationic antimicrobial agent or a zinc salt or a mixture thereof.

European Patent Application 0,251,591, Jackson et al., filed June 19, 1987 relates to oral hygiene compositions comprising specified pyrophosphates and antibacterials.

The synthesis of tartrate monosuccinate and tartrate disuccinate compounds of the type used in the practice of this invention is disclosed in U.S. Pat. No. 4,663,071, to Bush, Connor, Heinzman and Mackey, granted May 5, 1987.

All of the foregoing patents and publications are incorporated herein by reference.

## SUMMARY OF THE INVENTION

The present invention encompasses oral care composition, comprising:

a) An effective amount of an anticalculus agent which is a member selected from the group consisting of the acid or salt form of tartrate monosuccinate, tartrate disuccinate, and mixtures thereof;

b) An effective amount of a plaque-inhibiting polymer; and

c) A toxicologically acceptable oral carrier.

Typical oral care compositions herein comprise at least about 0.1%, generally from about 1% to about 15%, by weight of said anticalculus agent. Preferred oral care compositions, herein are those wherein said anticalculus agent is a mixture of said tartrate monosuccinate and tartrate disuccinate at a weight ratio of tar-

trate monosuccinate: tartrate disuccinate from about 20:80 to about 80:20, most preferably at a weight ratio of about 40:60.

In the oral care compositions herein, non-limiting examples of the plaque-inhibiting polymer comprise members selected from the group consisting of carboxy starch polymers (preferred), acrylic acid polymers, phosphoric acid polymers, maleic acid polymers, sulfonated polymers, and mixtures thereof, and other polypeptides, as well as modified forms of such polymers, e.g., zinc-anionic polymer combinations, and mixtures thereof. As noted, the preferred polymers herein are poly-anionic. Typical compositions herein comprise an effective amount, i.e., at least about 0.1% by weight of said polymer, generally from about 0.1% to about 5.0% by weight of said polymer, or polymer mixtures. Higher levels, e.g., 15%, can be used, if desired.

It will be appreciated that oral care compositions according to this invention include, but are not limited to, those the oral carrier comprises a dentifrice, mouthwash, lozenge or chewing gum.

It will also be appreciated that oral care compositions according to this invention can also, optionally, comprise an effective amount of various oral care adjuvants, especially those which are members selected for the group consisting of:

- i) fluoride ion sources;
- ii) antibacterial agents;
- iii) sodium and potassium nitrates;
- iv) sources of zinc, indium, strontium or stannous cations;
- v) peroxides;
- vi) chelants and sequestrants selected from various phosphates, and EDTA; and
- vii) mixtures of adjuvants i through vi.

Typical anti-calculus, anti-plaque and anti-caries compositions will, for example, contain a fluoride ion source such as those selected from sodium fluoride, sodium mono-fluorophosphate and stannous fluoride. Antibacterial agents such as TRICLOSAN (5-chloro-2-(2,4-dichlorophenoxy)phenol, also known as 2,4,4'-trichloro-2'-hydroxydiphenyl ether; see U.S. Pat. No. 3,506,720) can advantageously be used in the present compositions to further control plaque and gingivitis. Such examples of adjuvants are given here by way of example, and not for purposes of limitation.

The present invention also encompasses a method for preventing the accumulation of calculus on dental enamel while concurrently inhibiting plaque formation on (or adherence to) said enamel, comprising contacting said enamel with a safe and effective amount of a composition as disclosed herein. Such methods can be carried out in conjunction with the use of various adjunct oral care ingredients, as described in more detail herein-after.

All percentages, ratios and proportions herein are by weight, unless otherwise specified.

## DETAILED DESCRIPTION OF THE INVENTION

I. TMS/TDS: The present invention employs tartrate monosuccinate and tartrate disuccinate materials of the following formulae:

